can have no hesitation in adopting the terms "early stuck together" instead of "monophyllous in the early stages," if that will make the idea clearer, for it was precisely my object to show that the term monophyllous as applied to the pine was simply a case of the "early sticking together" of the leaves of the plant.

THOMAS MEEHAN.

To Botanists.—I have published a Catalogue or Check-List of the Phænogamous and Vascular Cryptogamous Plants of North America, containing the names of nearly 10,000 species. It is, so far as I know, the most complete list ever published of the plants of this country. It contains 112 pages, and will be found of the utmost utility as an auxiliary to the successful arrangement of a herbarium, and invaluable for making exchanges.

Paola, Kansas. J. H. OYSTER.

Botanical Notes.

Systematic Position of the Bacteria.—In a Review of recent works on bacteria, Dr. C. Fisch (*Biolog. Centrabl.* v., pp. 97–102) shows that the assignment of the Schizomycetes to the fungi does not rest upon a sound morphological basis, the physiological resemblance in the absence of chlorophyll not being sufficient of itself to show a genetic affinity. The history of development furnishes conclusive evidence against the Schizomycetes being connected with the fungi phytogenetically, either as an early form of development or as the result of retrogression. The nearest affinity of the bacteria lies unquestionably with certain green organisms, *Nostoc*, *Oscillaria*, etc., included under the Schizophyceæ or Cyanophyceæ; and these form together a natural group of Schizophyceæ, with no close affinity to any group of fungi. According to our present state of knowledge, the Schizophyta must be regarded as displaying the nearest genetic affinity with the Flagellata.—*Journ. Royal Microscop. Soc.*

The Filmy Ferns of Jamaica.—Under this title, Mr. J. H. Hart has contributed to the *West Indian Field* an interesting article to which he appends a list of all the *Trichomanes* and *Hymenophylla* known to inhabit the island of Jamaica—22 species of the former and 13 of the latter.

Forestry Statistics.—At the American Forestry Congress, recently in session in Boston, some very valuable statistics were presented relative to the timber supply of this country. The land area of the United States is placed at 1,856,070,400 acres; total forest area, 440,990,000 acres; total farm area, 295,650,000 acres. Of unimproved and waste lands, including "old fields," there are 1,115,430,400 acres. There are 150,000 miles of railway, including side tracks. It has required 396,000,000 ties for their construction. Supposing that the ties require to be renewed once in six years, and that 10,000 miles of new road are built annually; if twenty-five years be allowed as the time necessary for trees to attain a size suitable for making ties, then it would require 15,000,000 acres of standing timber to supply the annual demand for them. But with the increase of railroads, it is to be considered that the annual demand for ties is all the while increasing.

The census reports the consumption of 145,778,137 cords of wood and 74,000,000 bushels of charcoal for fuel in dwellings, stores, factories, steamboats and locomotives. This in a single year would clear the forests from an area of 30,000,000 acres. The census also reports that in 1880 forest fires consumed the trees on 10,274,089 acres, and there is no reason to believe that a less area will be burned over than in 1880. The census gives the amount of lumber cut in 1880 as 18,000,000,000 feet. Last year the cut had increased to 28,000,000,000 feet, which would lay bare an area of 5,600,000 acres. Altogether, it appears that the forests of the country are subject to an annual drain of 50,750,089 acres. It may well be inquired how long the forests can endure this drain—how long the country can bear this rapid destruction of the most important material element of its prosperity.

The Shaw School of Botany, endowed by Mr. Henry Shaw as a Department of Washington University, at St. Louis, was formally inaugurated on the 6th instant., the address being delivered by Mr. William Trelease, who has been appointed to the chair of botany, which is to be known as the Engelmann Professorship. The work of the school, outside of the University classes, will begin with the formation of a class for the study of grasses. A class in analytical botany will take up the study of spring flowers on Tuesday and Thursday afternoons and Saturday mornings, from April 6th till June 12th, 1886.

Distribution of Crystals of Oxalate of Calcium in the Leaves of Leguminosæ.—Some investigations on this subject have been made by Prof. J. P. Borodin, who has examined 660 species with the following results: In the Mimoseæ the occurrence of the crystals is very constant, and they are arranged in a solitary manner parallel with the veins. In the Cæsalpineæ the distribution is the same, but, in addition, there are clusters of crystals scattered through the parenchyma of the leaf. These do not occur in the Papilionaceæ. In the Papilionaceæ there are three principal types: (1) Crystals altogether wanting (in the Genisteæ, many Galegeæ, as *Astragalus* and *Colutea*, and some genera of other groups; (2) clinorhombic crystals along the veins (in the Vicieæ and Trifoliaceæ), and clinorhombic crystals scattered through the parenchyma (in some Phaseoleæ and Galegeæ); clinorhombic crystals in groups in the epidermis (in *Dioclea* and *Canvalia*), and crystals in the membrane of the epidermis (in *Stylosanthes*). When crystals are wanting in the leaves, they are deficient also in the stem. (*Jour. Roy. Micros. Soc.*) These investigations after further elaboration may perhaps serve as a clue to the genus to which any leguminous plant belongs, in cases in which only a leaf can be obtained.

Experiments in Crossing Solana.—Some interesting experiments have lately been made by Messrs. Sutton, of Reading, in the crossing of potatoes already in cultivation with the *Solanum Maglia* of littoral Chili and with *S. Commersoni*. Hybrids with *S. Maglia* have been obtained, but a cross could not be effected with *S. Commersoni*. The same firm has also made the curious experiment of fertilizing the "Victoria" potato with the pollen of a tomato, and other potatoes with the pollen of *Solanum Dulcamara* and *S. nigrum*, reversing the

cross in some instances. From these cross-fertilizations seed has been obtained, and the result of their cultivation will be awaited with interest.—*Gardeners' Chronicle.*

Variations in Quercus prinoides.—At a meeting of the Philadelphia Academy of Natural Sciences, August 4th, Mr. Meehan exhibited a series of fruiting specimens of branches of *Quercus prinoides.* In some, the leaves were almost orbicular and obtuse, in others narrowly lanceolate or saliciform and acute, others had lobed and wavy edges, while others were quite entire. The plants were all growing within a few feet of each other, and the parent plants were also all under the same conditions of environment, and were all at no distant date from one parentage.

They were exhibited, said Mr. Meehan, for two purposes—first to show that what was commonly understood as environment was not a main factor in the origination of variation, and secondly to show that variation was independent also of mere conditions of growth or sexual peculiarities to which variation was sometimes referred. It was indeed true that young plants often had leaves varying from those on the older plants, and plants or branches bearing flowers of one sex would have characters varying from those of another sex, but these specimens were all fertile, and with young acorns. There was no possible ground for any suggestion as to different conditions in any sense, and the variations could be attributed only to an innate and wholly unknown power to vary, which science had so far been unable to reach.

Sonora Gum.—A substance called "Sonora gum," somewhat resembling a gum-resin in external appearance, and of hitherto uncertain origin, is found sparingly in commerce in California, and is used by brewers there in the manufacture of porter. Upon an investigation of the matter, Mr. F. Grazer finds that this so-called gum is the exudation from the branches of *Larrea Mexicana*, which was referred to under the title of Arizona shellac in a paper read by Professor Stillman at a meeting of the California Academy of Sciences several years ago. Mr. B. B. Redding, at the same meeting, referred to the plant as a source from which our commercial shellac could be obtained, stating that these lac-yielding plants, including *Acacia Greggii*, were as plentiful as the so-called sage-brush, from Southern Utah to New Mexico, and from the Colorado desert to Western Texas, the lac being most abundant around stations on the Mojave and Colorado deserts. The exudation, which takes place as the result of an insect's sting, could be easily collected by boiling the twigs in water, the gum (?) which rises to the top being skimmed off, strained, and dried on smooth stones, and hand-pressed into flakes, ready to make sealing wax or varnish. The plant requires a rainfall of three inches a year.

Formation of Gum in Trees.—Some time since, Sir James Paget created considerable interest by quoting in one of his lectures the results of an investigation by Dr. Beijerinck into the cause of the formation of gum in trees, which led him to believe that it was due to a pathological change brought about by the influence of a fungus (BULLETIN, xi., 33). Working quite independently, and in ignorance of Dr. Beijerinck's researches, Dr. Wiesner has since arrived at a sim-

ilar conclusion, except that he attributes the formation of gum to the action of an unformed ferment (*Monatshefte*, vi., 592). This ferment he considers to belong to the starch-converting or diastatic enzymes, but to differ from the ordinary members of this group in that, while it converts starch into dextrin, it produces no sugar that reduces Trommer's solution. The seat of the development of the gum ferment appears to be the granular protoplasmic matter of the parenchyma cells. From thence it attacks the cellulose of the cell walls, converting it into gum or mucilage, in the latter case disappearing itself from the finished product. The ferment probably converts any starch it may meet with into dextrin, though never into a reducing sugar; indeed it seems capable of arresting the action of diastase in this direction, when added to a solution of dextrin containing diastase.

A Square-Stemmed Bamboo.—The great predominance of the cylindrical form over all others in the trunks, branches and stems of plants renders an exception to the rule of considerable interest. The existence of a square-stemmed bamboo in China and Japan has several times been mentioned, but the assertions of travelers in regard to it have been received with some incredulity. There can be no doubt about the matter now, however. This variety of the bamboo is described and figured in a Japanese book, the *Sô Moku Kin Yô Siû* (Ornamental-leaved Trees and Shrubs), published at Kyota in 1829, and in the *Ju Moku Shiri-yaku* (Short Description of Trees) of Kinch, of Tokiyo. In 1880 some specimens of this bamboo were presented to the Kew Gardens, and it seems that it had been introduced into France some time before that. Nothing has been known of its presence in China until within a very recent period, say in 1882, when Mr. F. S. A. Bourne met with some specimens during the course of a voyage. It seems, from an extract from the *North China Herald* cited in *Nature*, that the Chinese hold the plant in great esteem, cultivate it as an ornament and put it to many uses. When young the stem is nearly cylindrical, but becomes square in time. It is, according to its age, manufactured into canes and pipe-stems. This peculiar variety of the bamboo is found in Chekiang, Tunnan and a few other regions. The Chinese attribute its form to supernatural power or to sorcery.

The Lechuguilla (*Agave heteracantha*, Zucc.), says Dr. Havard, is the most important of the soap or *amole* plants of Southwestern Texas and Northern Mexico. Iu the process employed for extracting the fibre, the parenchyma or pith squeezed out constitutes about 40 per cent. of the green leaf; when dried it is a white-yellowish, mucilaginous powder which possesses remarkable cleansing properties principally due to the presence of saponin. Its composition is very probably analogous to that of the root of *Yucca baccata*. Rubbed with water, it foams and lathers, answering the purpose of good soap without, owing to its freedom from alkali, its disadvantages. It imparts a smooth and satiny appearance to the skin, and is used successfully in removing stains from the most delicate fabrics. It tends rather to set than to displace colors, and articles likely to fade may be washed with it in safety. It is also an excellent wash for the scalp and hair, leaving the latter soft and glossy. If this powder could be compressed

into small cakes or tablets it would doubtless become an important article of trade.

Mexicans and Indians, after removing the prickles, pound the leaves into a pulp which they use instead of soap.

The Root of Baptisia tinctoria has recently been examined by Dr. von Schroeder (*Chem. Zeit.*, Oct. 14th), who finds therein, among other constituents, an alkaloid which he calls baptitoxine, and which has a poisonous action even in small doses. In frogs this alkaloid produces cessation of the respiration and then paralysis; in warm-blooded animals it causes a slowing of the respiration and an increase in the reflex irritability of the medulla.

Economic Uses of Opuntias.—Dr. Harvard, in *Proceedings of U. S. National Museum*, says of the prickly pears: "The joints, erroneously called 'leaves,' are readily eaten by cattle and sheep, for which they are an important article of food. It is well, as far as far as practicable, to make them undergo a preliminary scorching for a few moments, over a bright fire, to burn off the bristles and blunt the spines. I have seen cattle eating nopal leaves with great relish in the open field, although there was good green grama near by, seemingly indifferent to the many bristles and spines sticking to their noses. There are times when they prefer them to any other food. These leaves contain a large proportion of water and often save cattle and sheep from great suffering in dry seasons. If the time of drought be much prolonged, however, they lose much of their water by evaporation and become very thin; the pulp shrinks and the fibrous framework preponderates; in this state they are liable to cause sickness in animals feeding on them. During the three or four winter months, on the Lower Rio Grande, sheep often get no other food than nopal leaves. Every morning the shepherd cuts down, with his hand-ax or *machete*, the amount required for the day; as a rule he does not fire them. It is to be noted that as long as they feed on them the sheep require no drinking water.

"The nopal leaf is much used by Mexicans and frontiersmen as a poultice in bruises, ulcers and sores of all kinds. It is first slightly toasted to remove bristles and thorns, as well as to warm and soften the pulp; then it is split in two, or simply one of the surfaces shaved off, and the exposed pulp applied to the part. From the testimony of many intelligent people I am inclined to regard this as an excellent healing and gently stimulating application.

"It is also useful to clarify water. After being scorched it is mashed into a pulp, which, when thrown into water, like egg albumen, drags all impurities to the bottom.

"Again, this leaf may be prepared for food by boiling it in salt water; if afterwards cut up into a hash with eggs and chile colorado, it makes quite a savory dish."

Preserving Plants.—For the last three years, says Mr. P. Henning, certain fruits, flowers and other portions of plants have been preserved in perfect condition at the Berlin University (Botanical Museum) by means of a solution consisting of four parts of water and one part of alcohol saturated with salicylic acid.

Retirement of Sir J. D. Hooker.—After occupying for nearly

twenty years the position of director of the Royal Gardens, Kew, Sir Joseph Hooker now resigns that post. Though nearly seventy years of age, he seems as full of vigor and work as when, forty-five years ago, he joined Sir James Ross's Antarctic expedition as assistant surgeon in the *Erebus* and *Terror*. That voyage yielded a substantial contribution to botanical science. Not only as a botanist, but as a lecturer, he stands in the highest rank. His botanical work during his well-known wanderings in the Himalayas is of scarcely less scientific importance than that of the Antarctic regions, New Zealand and Tasmania; while it is difficult to conceive that his Himalayan Journals can ever be out of date, either for instruction or entertainment. Nor must the journey which he made in Morocco with Mr. John Ball be forgotten, and its substantial narrative, not to mention his run across America with that most genial of scientists, Prof. Asa Gray. No one probably did Darwin more service when working out his Origin of Species. As an eager fellow-worker and loyal assistant, few probably know the services Sir Joseph rendered to one who was the greatest of revolutionists, as well as the foremost of evolutionists. But it is as the director of Kew Gardens that Sir Joseph must be specially remembered at present. There he has held sway for thirty years—ten as his father's assistant and twenty as chief. It is mainly due to the Hookers that this royal domain has become the largest and finest garden in the world. The director of such an institution can have but little of that quiet and unworried leisure which is absolutely necessary for the best work in science, and it is this consideration, and not any feeling of failing faculties, that determined Sir Joseph to resign his trying post at the end of November.

The Papaw (*Carica papaya*).—All students of botany are well acquainted with the accounts given by travelers of the uses and wonderful properties of the fruit of *Carica papaya*, and most of us have read how the application of the juice of this fruit to a piece of tough meat will cause a disintegration of its fibres and consequently render it tender. Browne, in his Natural History of Jamaica, says that meat quickly becomes tender if it is washed in water to which some papaw juice has been added, and, if left in such water for ten minutes, it will drop from the spit while roasting, or separate into shreds while boiling. It is likewise said that in Barbadoes and other West India islands, it was once customary to feed pigs on the green fruit; but it was found that if these animals consumed any very large quantity without a sufficient proportion of other food, they not only suffered in health, but death actually followed in some cases from the intensity of the chemical action. Owing to the interest that has recently sprung up in Europe regarding the chemical action of this fruit, a large demand has risen for the dried juice and the commercial papain, both of which have lately been submitted to a new examination by Dr. S. H. C. Martin, who records his results in the *British Medical Journal* for July 25th.

Wurtz had described the ferment of the papaw as a proteid, soluble in distilled water, yet precipitated by nitric acid, but differing from a native albumen (as white of egg) in not being precipitated by boiling. In the material used by Dr. Martin in his former experi-

ments (commercial papain) he found two proteids, a globulin and a "peptone"; and he could not come to any conclusion as to which of these bodies was the ferment, or, to speak more correctly, which was associated with it.

In the present investigation he has attempted to settle this point. In the first place, the body called a "peptone" in a previous paper is not a true peptone, but is one of the bodies intermediate between globulins and peptones, first described by Meissner as a peptone, and called by Kuhne *hemialbumose*. This body agrees with peptone in certain reactions, and experiment shows that the ferment-action is associated with hemialbumose.

Of the results obtained in the investigation of the action of papain on the proteids in papaw-juice only a brief summary can be given. Of late years the former ideas of the nature and constitution of vegetable proteids have been entirely revolutionized, chiefly by the researches of Denis ('Mémoire sur le sang'), Weyl, Hoppe-Seyler, Vines, and others; so that now we may state that the two chief proteids found in plants are globulins and "peptones." Vines considers that there is no true peptone in the seeds of plants; he thinks it is a hemialbumose, and explains away Ritthausen's "legumin" and "conglutin," obtained from the seeds of *Leguminosæ*, referring the former to the class of hemialbumoses and the latter to a changed form of proteid produced by the action of alkalies and globulin. By pursuing the method first instituted by Denis, Dr. Martin obtained from papaw-juice proteid bodies whose reactions agree with those of the globulins and hemialbumoses, or rather albumoses, leaving the question as to whether they are anti- or hemia-forms for further consideration. The albumose precipitated by sodio-magnesium sulphate corresponds to Vines's hemialbumose. This albumose gives the same reactions as those of the body with which the ferment is so closely associated: it is the proteid in the juice most like a peptone. Dr. Martin found no true peptone.

The action of papain on these different constituents is peculiar, because in Dr. Martin's former experiments he has been able to discover no true peptone as a result of digestion; the body which is formed from the globulins is the albumose found in small quantities in the salt extract, the body which corresponds to Vines's hemialbumose.

Botanical Literature.

Thirty-eighth Annual Report on the New York State Museum of Natural History. Report of the Botanist, Chas. H. Peck. Albany, Weed, Parsons & Company. 1885.

From this Report we learn that one hundred and ninety-two species of plants were last year mounted and added to the State herbarium, and that of these (of which very many were fungi not before published) one hundred and sixteen were not previously represented therein. To these must be added two State species sent by correspondents, and new to the herbarium, making the total number one hundred and eighteen.